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(54) **VEHICLE POWER SYSTEM WITH INTEGRATED GRAPHICS DISPLAY**

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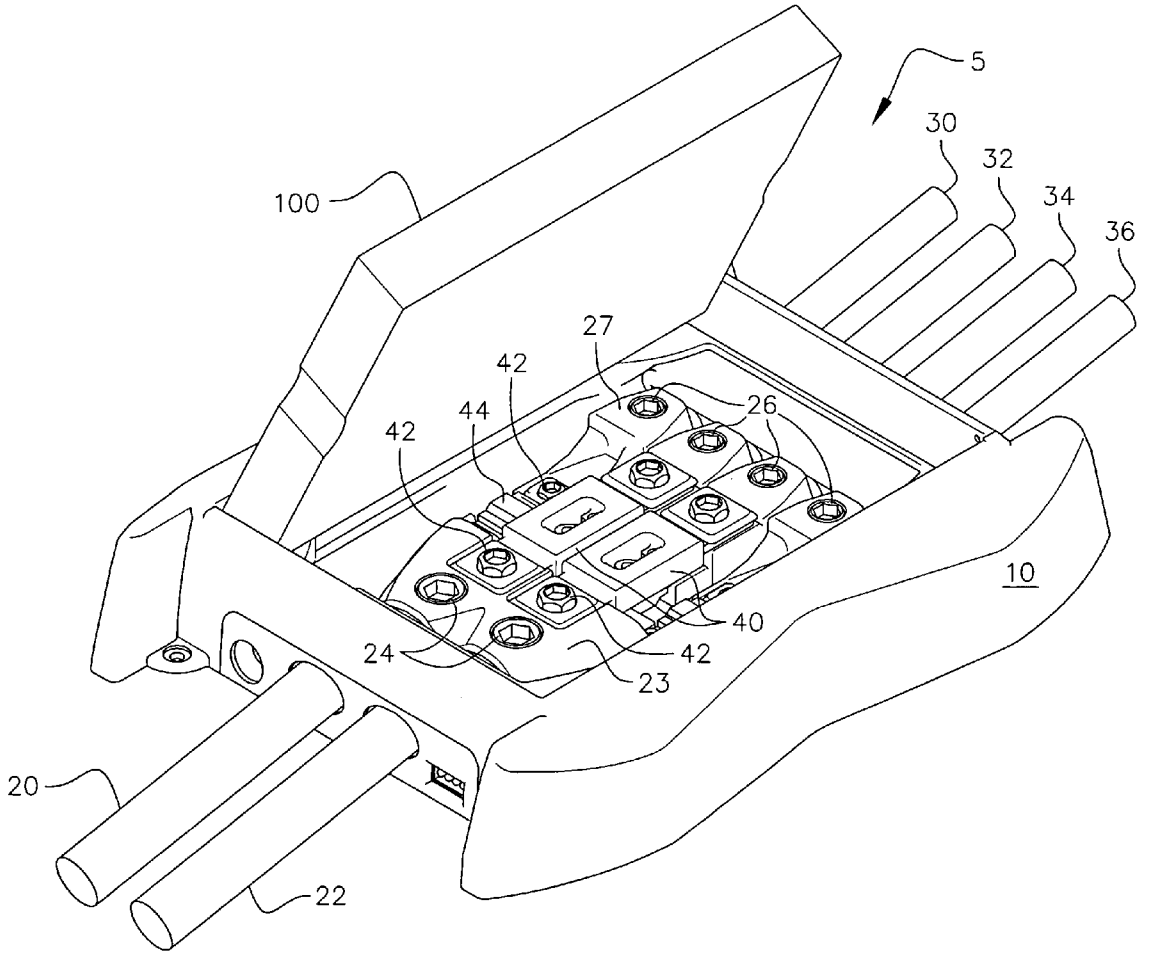
(57) **ABSTRACT**

A power system with graphics display includes power inputs, power outputs and power protection and/or power conditioning adapted between the power inputs and power outputs. A graphics display is included in the system for displaying graphic images from an external video source.



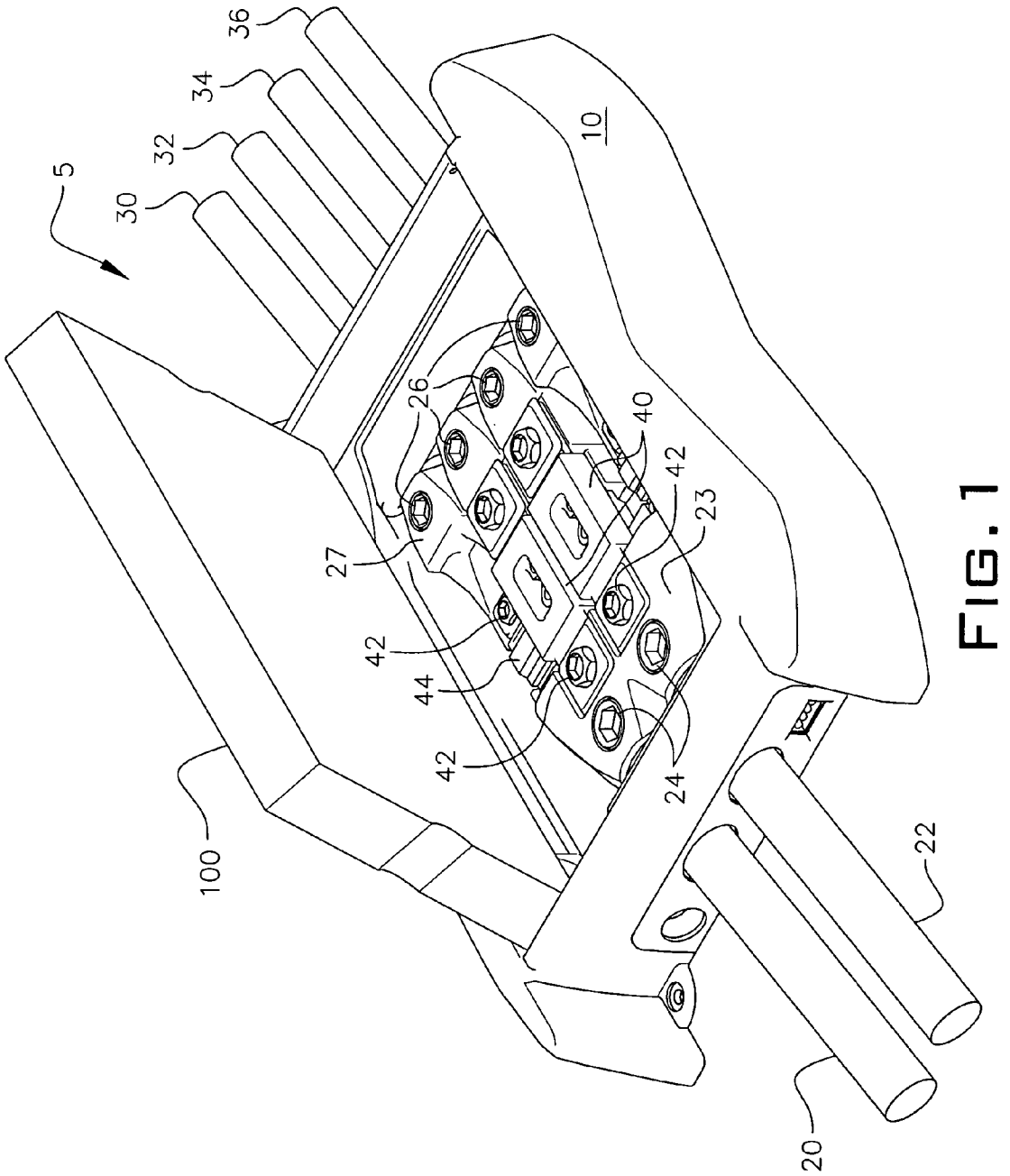


FIG. 1

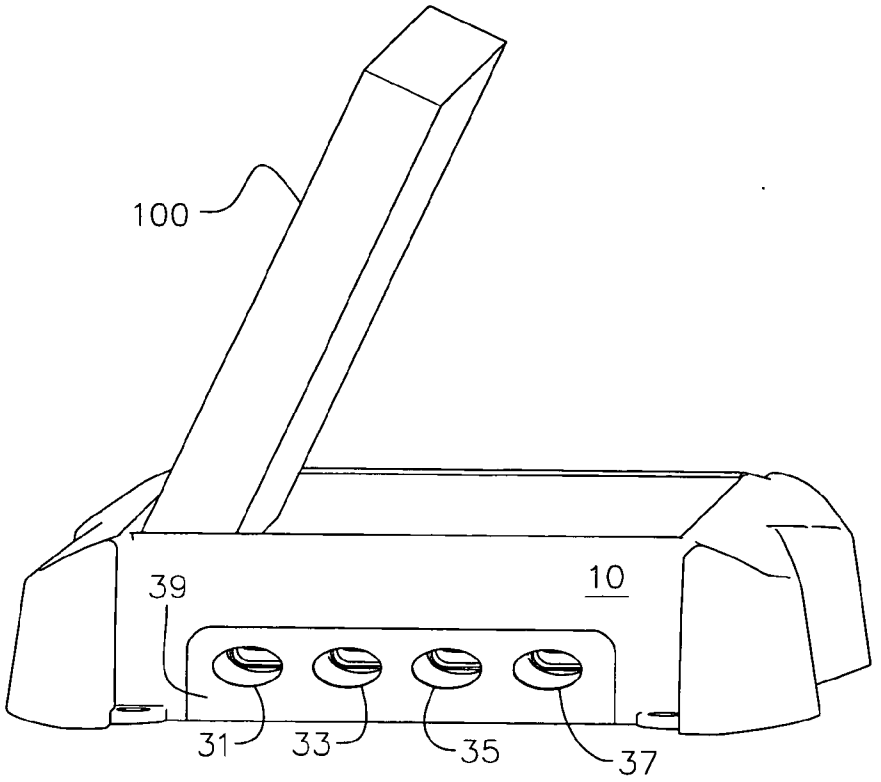


FIG. 2

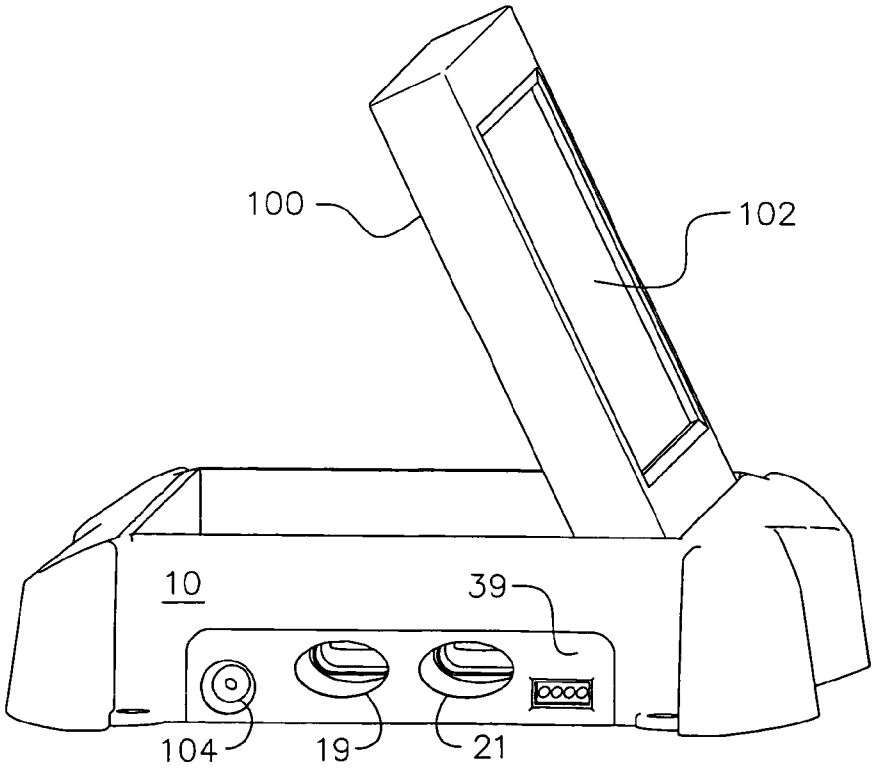


FIG. 3

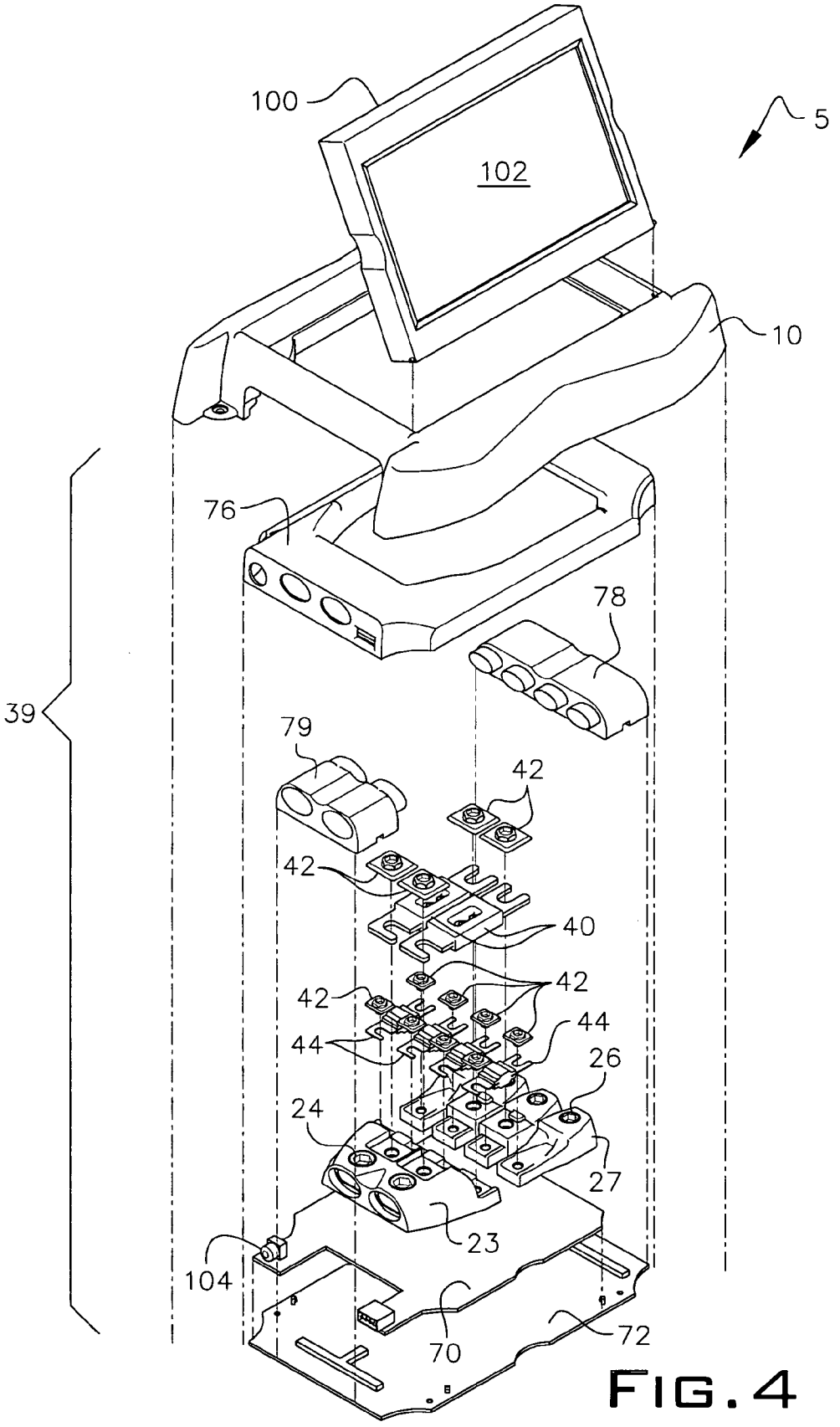


FIG. 4

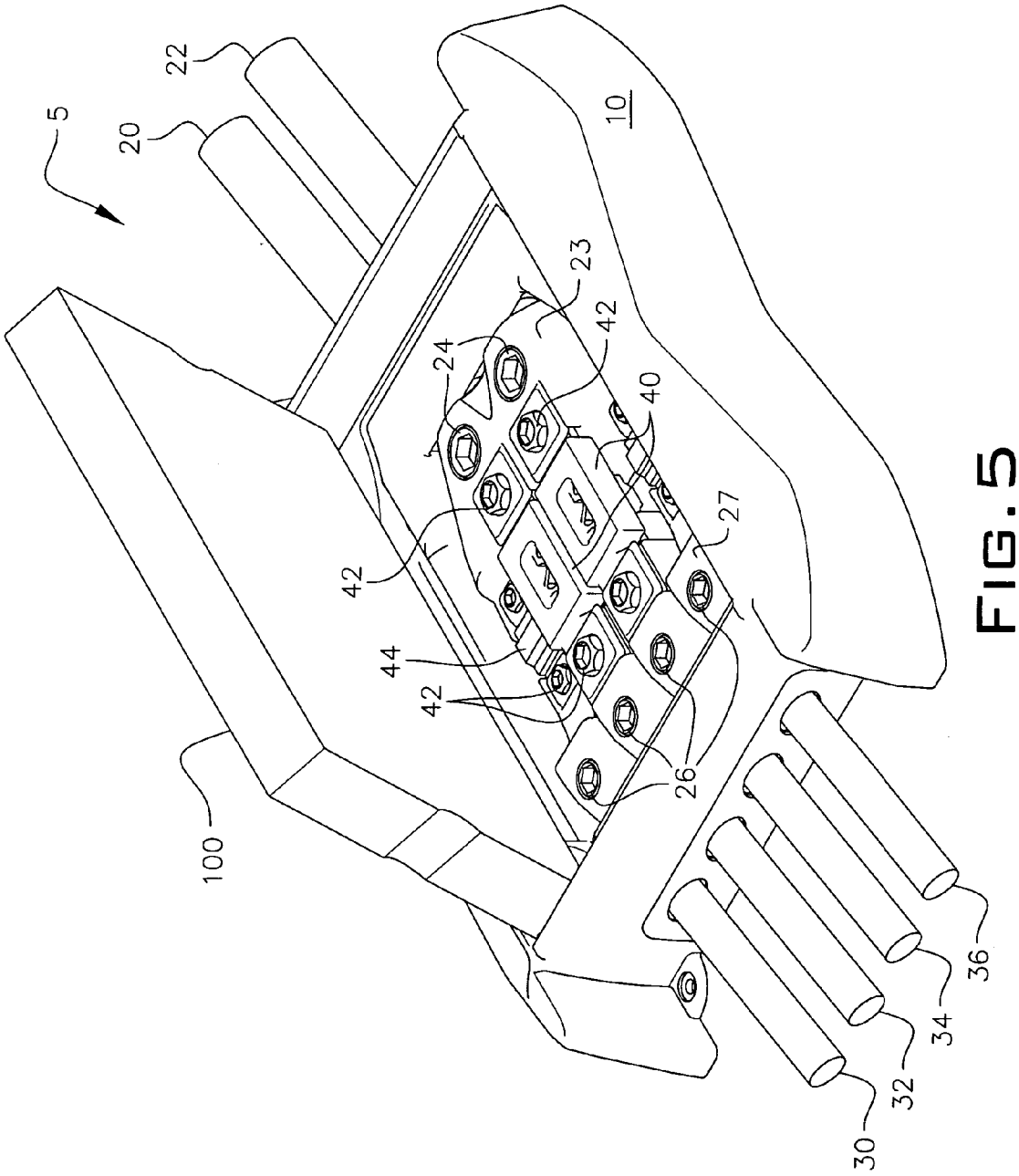


FIG. 5

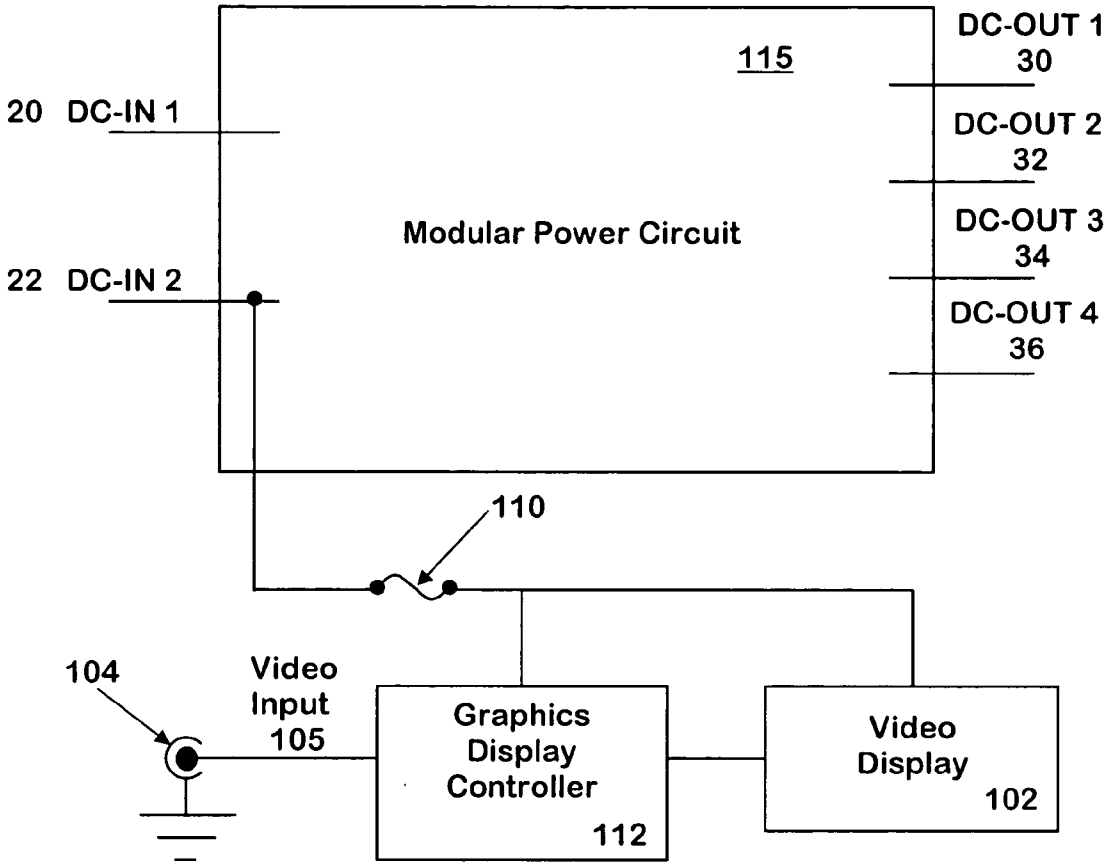

115
DC-OUT 1
30
20 DC-IN 1
DC-OUT 2
32
Modular Power Circuit
DC-OUT 3
34
22 DC-IN 2
DC-OUT 4
36
110
104
Video
Input
105
Graphics
Display
Controller
112
Video
Display
102

Fig. 6

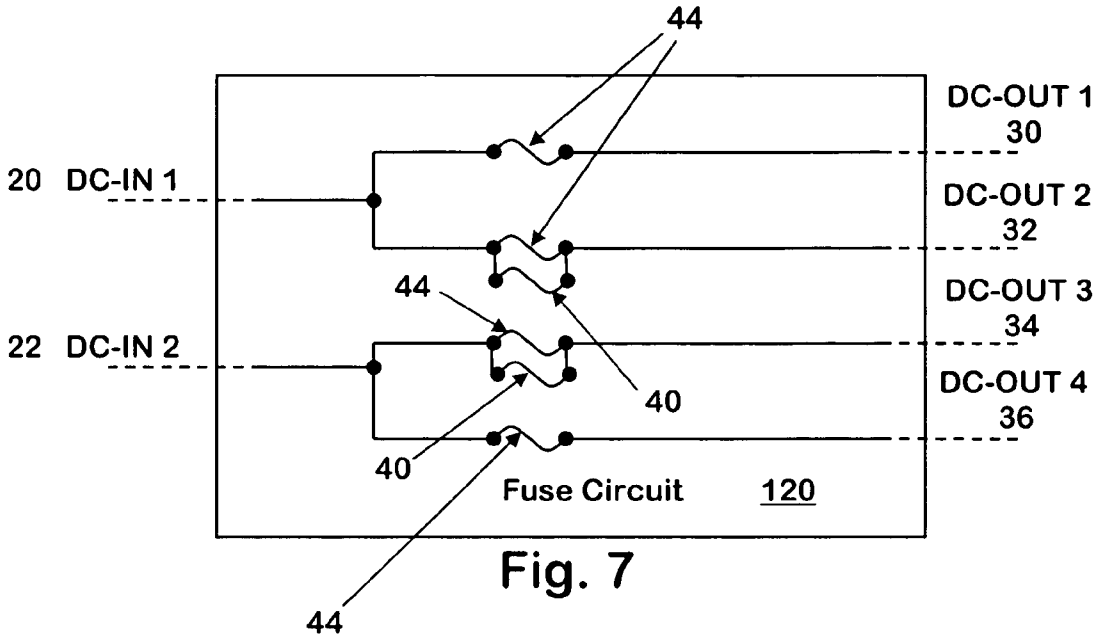

44
DC-OUT 1
30
20 DC-IN 1
DC-OUT 2
32
44
DC-OUT 3
34
22 DC-IN 2
40
DC-OUT 4
36
40
Fuse Circuit 120
44

Fig. 7

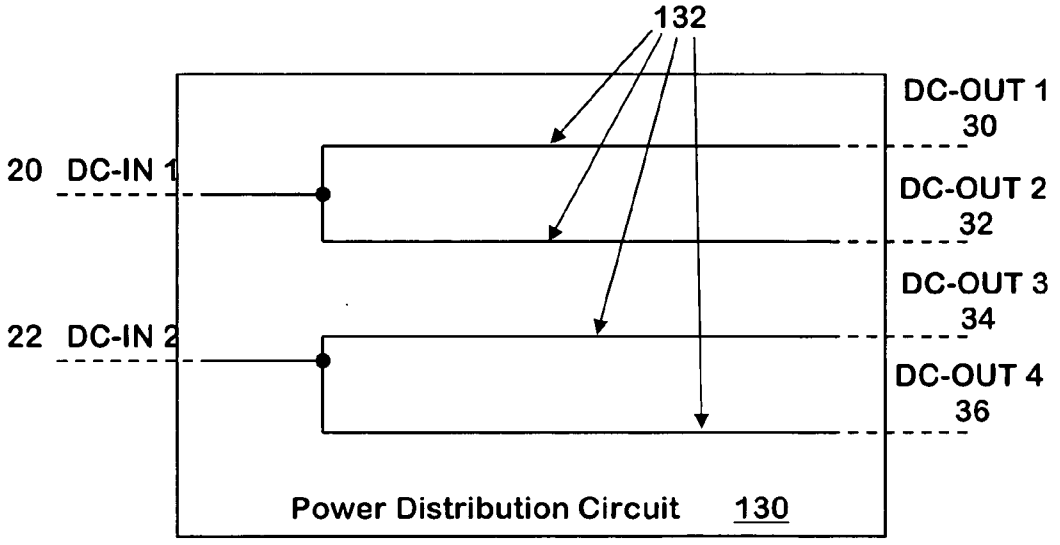

132
DC-OUT 1
30
20 DC-IN 1
DC-OUT 2
32
DC-OUT 3
34
22 DC-IN 2
DC-OUT 4
36
Power Distribution Circuit 130

Fig. 8

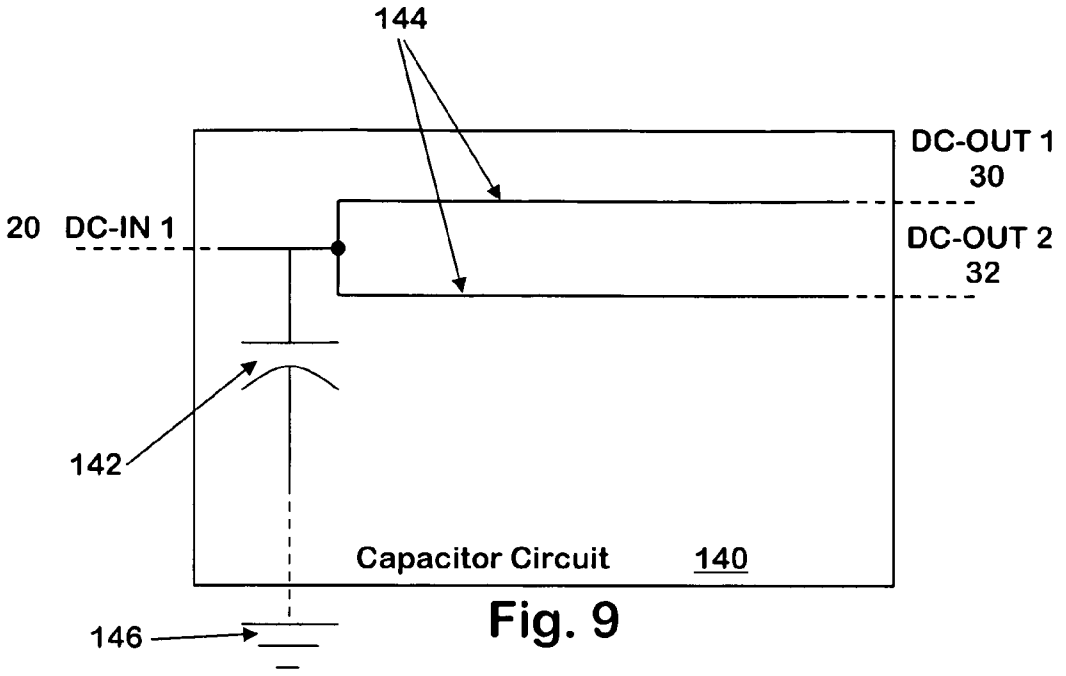

144
DC-OUT 1
30
20 DC-IN 1
DC-OUT 2
32
142
Capacitor Circuit 140
146

Fig. 9

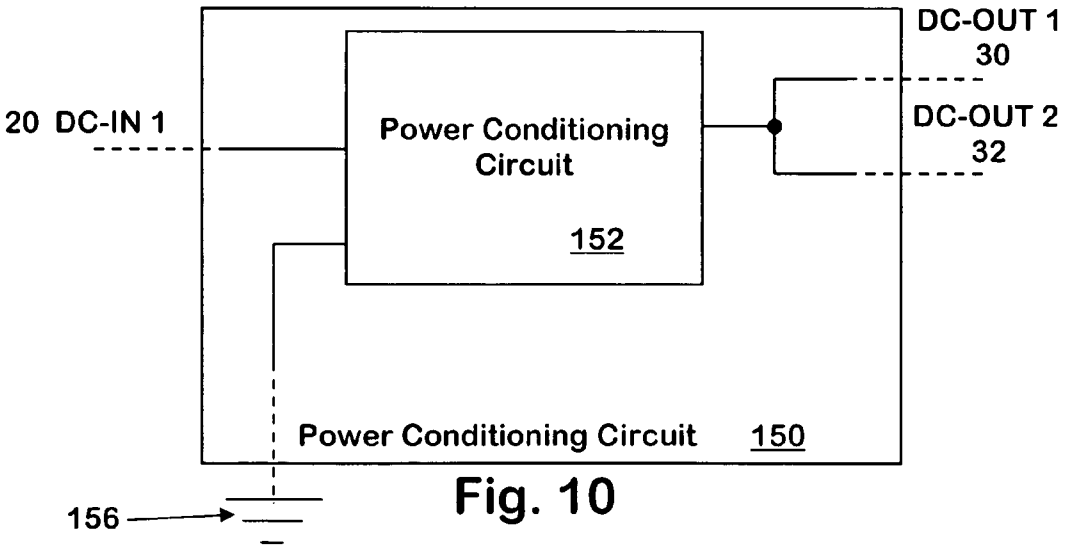

DC-OUT 1
30
20 DC-IN 1
Power Conditioning Circuit
152
DC-OUT 2
32
Power Conditioning Circuit 150
156

Fig. 10

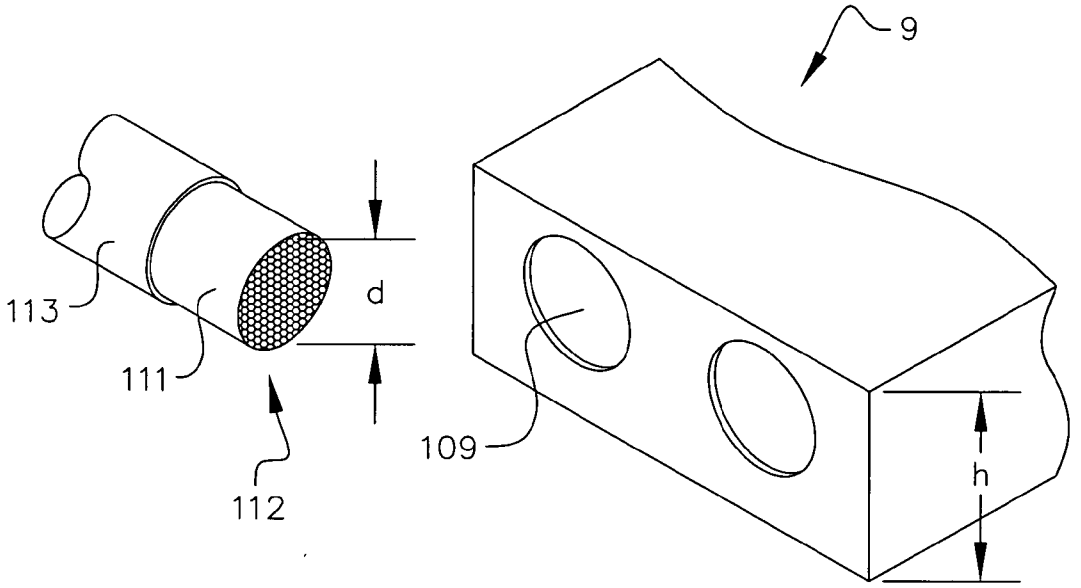


FIG. 11A
(PRIOR ART)

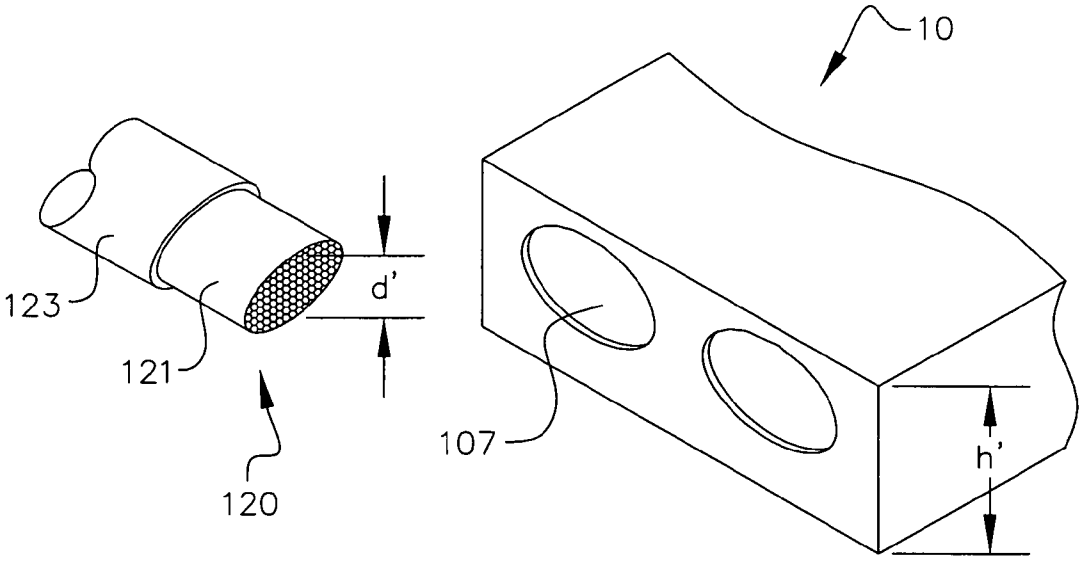


FIG. 11B

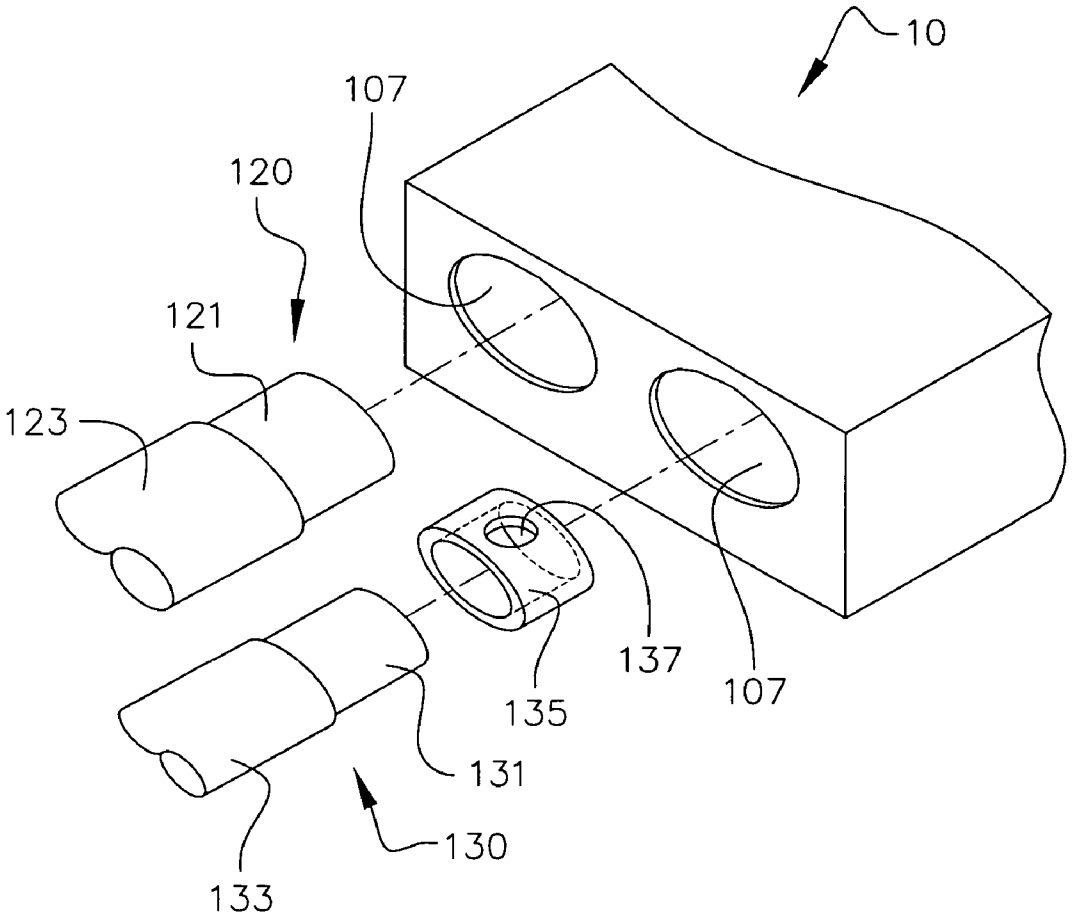


FIG. 12

VEHICLE POWER SYSTEM WITH INTEGRATED GRAPHICS DISPLAY

[0001] This application is related to U.S. application Ser. No. titled, "VEHICLE POWER SYSTEM WITH WIRE SIZE ADAPTER," which was filed on even date herewith; attorney docket number 389.84 and inventors Alberto A. Lopez, John Catalano and Nathan Wincek. Additionally, this application is related to U.S. application titled, "VEHICLE POWER SYSTEM UTILIZING OVAL WIRE," which was filed on even date herewith; attorney docket number 389.85 and inventors Alberto A. Lopez, John Catalano and Nathan Wincek. Additionally, this application is related to U.S. application titled, "VEHICLE POWER SYSTEM WITH ROTATBLE MAIN ASSEMBLY," which was filed on even date herewith; attorney docket number 389.86 and inventors Alberto A. Lopez, John Catalano and Nathan Wincek.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to the field of conditioning or distributing power within a graphics display system and more particularly to an apparatus that provides a graphics display and power conditioning, distribution and/or fusing in one integrated device.

[0004] 2. Description of the Related Art

[0005] Automotive accessories are becoming more functional and decorative. High power audio amplifiers, lighting systems, automation systems and even waterfalls have been installed in vehicle doors, passenger compartments and trunks. These devices utilize large amounts of power and put significant loads on the vehicle's power distribution systems. The art has many examples of vehicle power distribution, including U.S. Pat. No. 6,746,279, "Power Distribution System," to Lopez, which is hereby incorporated by reference. This patent describes a power distribution and fusing system that accepts one or two larger power wires, fuses the power and distributes the power over several smaller gauge wires.

[0006] Additionally, there is a need for lighting and display. U.S. Pat. No. 6,181,563, "Meter Device for Vehicle," to Shimbu, et al, describes a vehicle metering and display device and is hereby incorporated by reference. This device has a display for displaying vehicle speed and engine speed, for example. The display is mounted in the passenger compartment and visible to the driver. The device of this patent does not distribute power to other devices. Furthermore, the display is provided for displaying information according to signals from the electronic component units integrated into the device and not enabled to accept external, fully-graphical video sources.

[0007] Historically, power has been distributed by a single power cable carrying one voltage potential, usually positive, and the frame of the vehicle carrying the other voltage potential, usually negative. The power cables of the prior art are generally heavy gauge, stranded wire of a size suitable for carrying the current required by the load. Standard wire comes in sizes that are numbered based upon its diameter and hence current carrying capacity with the higher numbers used for smaller wire having lower current carrying capacity. For heavy loads, a larger wire size is used. Unfortunately, as more current is required, the wire diameter increases requiring higher-profile connecting devices, causing difficulty in bending and shaping the wire and, when run under carpet, creating bumps and bulges. Oval shape wire has been used in very narrow applications for delivering high-voltage power in the AC power grid. For example, U.S. Pat. No. 5,171,942 to Wilber F. Powers, issued Dec. 12, 1992, describes a specialized oval wire for overhead high tension lines and is hereby incorporated by reference. This patent describes a very special type of oval power line and does not imply any other use for such oval cable. In another example, U.S. Pat. No. 6,353,177 B1 to Walter W. Young, issued Mar. 5, 2002 describes a cable of oval form, but the core conductor is round and the insulator is oval. This type of power cable has all the issues related to a round cable described above with no advantage for automotive use. The oval design of its insulation improves its wind resistance which is not an issue in automotive applications.

[0008] Unfortunately, there is a lack of power conditioning, fusing, and/or distribution devices integrated with a general purpose graphics display in the art.

[0009] What is needed is an apparatus that will provide a general purpose graphics display and a power circuit in the same device.

SUMMARY OF THE INVENTION

[0010] An object of the present invention is to provide a power distribution device that includes a graphics display for displaying a wide range of colors, patterns and video.

[0011] In one embodiment, a power system with a display is disclosed including an enclosure and a graphics display housed in a display housing that is coupled to the enclosure. Power input connectors and power output connectors are situated on the periphery of the enclosure. A power distribution device is housed within the enclosure and accepts power from the at least one power input connector and delivers power to the at least one power output connector.

[0012] In another embodiment, a method for distributing power and providing a display is disclosed including providing a power system with display having an enclosure and a graphics display housed in a display housing hingedly coupled to the enclosure. The graphics display is connected to a graphics display controller and the graphics display controller connected to a video input connector. Power input connectors and power output connectors are situated on the periphery of the enclosure. A power distribution device is housed within the enclosure and accepts power from the at least one power input connector and delivers power to the at least one power output connector. Next, the power input connector is connected to a power input wire and the power output connector is connected to a power output wire and the video input connector is connected to a source of video.

[0013] In another embodiment, a power distribution system with a display is disclosed including an enclosure and a graphic display for displaying graphic images mounted in a display enclosure. The display enclosure is coupled to the enclosure by a hinge. A power input and a power output is situated on the periphery of the enclosure. There is a power distribution module housed within the enclosure adapted to accept power from the power input and to distribute power to the power output.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The invention can be best understood by those having ordinary skill in the art by reference to the following detailed description when considered in conjunction with the accompanying drawings in which:

[0015] FIG. **1** illustrates a perspective view of the apparatus of the present invention.

[0016] FIG. **2** illustrates a right-side perspective view of the present invention.

[0017] FIG. **3** illustrates a left-side perspective view of the present invention.

[0018] FIG. **4** illustrates an exploded view of the present invention.

[0019] FIG. **5** illustrates a perspective view of the apparatus of the present invention configured for opposite connections to that of FIG. **1**.

[0020] FIG. **6** illustrates a schematic diagram of the common electronics of the present invention.

[0021] FIG. **7** illustrates a schematic diagram of a fused distribution option of the present invention.

[0022] FIG. **8** illustrates a schematic diagram of a distribution block option of the present invention.

[0023] FIG. **9** illustrates a schematic diagram of a high capacity capacitor option of the present invention.

[0024] FIG. **10** illustrates a schematic diagram of a power conditioning circuit option of the present invention.

[0025] FIG. **11***a* illustrates a power cable and a power distribution box of the prior art.

[0026] FIG. **11***b* illustrates a power cable and a power distribution box of the present invention.

[0027] FIG. **12** illustrates a cable size adapter of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0028] Reference will now be made in detail to the presently preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. Throughout the following detailed description, the same reference numerals refer to the same elements in all figures. In the description of the device for distributing power of the present invention, the perspective views include a display and a power option having two power inputs, a plurality of fuses and four power outputs. This is an example of one possible configuration, whereas any number of inputs and outputs as well as several different power options are described later and can be installed into the same housing. The graphics display is multipurpose, in that it is useful for displaying video such as a video stream from a DVD player and text as well as emitting a wide range of colors and patterns, providing both aesthetic as well as safety features.

[0029] Referring to FIG. **1**, a perspective view of the apparatus of the present invention is shown. The power distribution system **5** includes an outer case **10** with a display (not visible) housed within a display housing **100**. The power distribution system **5** has a rotatable and exchangeable power distribution device allowing configuration with various power options that can be oriented so that power enters on the left side and exits on the right side or visa-versa, providing flexibility in the viewing direction of the display. The power distribution system **5** in this embodiment has two power inputs **20/22** connected through a power input connector, in this embodiment, a terminal block **23** and physically/electrically held by set screws **24**. The terminal block is sized to accept a specific size of wire. In some embodiments, the wire is oval or elliptical so that it lies flat when routed through a vehicle, especially under carpet, bends easy and so that the power distribution system can be designed to have a lower profile than if round wire is used. The inputs **20/22** are connected to a first terminal **42** of the fuses **40/44**. In this embodiment, two types of fuses are installed **40/44** but in some embodiments, only one type of fuse is installed providing flexibility in protection for each output **30/32/34/36** in that a first type of fuse has current ranges up to 40 amps, while another type fuse has current ranges up to 750 amps. The second terminal **42** of the fuses **40/44** is connected to a power output connector, in this embodiment, a second terminal block **27** for connection to the output power cables **30/32/34/36**, held electrically/physically with set screws **26**.

[0030] Referring to FIG. **2**, a right-side perspective view of the present invention is shown. The case **10** has a side cut-out that is filled with a surface **39** of the power distribution module and has four openings **31/33/35/37** configured to accept four output power cables (**30/32/34/36** from FIG. **1**). The display housing **100** is shown slightly tilted. In this embodiment, the display is rotatably coupled to the outer case **10** allowing adjustment to its angles.

[0031] Referring to FIG. **3**, a left-side perspective view of the present invention is shown. The outer case **10** has a side cut-out that is filled with a surface **39** of the power distribution module and has two openings **19/21** configured to accept two input power cables (**20/22** from FIG. **1**). The display housing **100** is shown slightly tilted and the display **102** is visible. The display **102** is of any flat panel display technology known in the industry, including but not limited to plasma, liquid crystal display (LCD), etc. In this embodiment, a video input connector **104** is provided for providing a video source to the display **102**. In some embodiments, display content is generated internally, providing varying colors, patterns and lighting effects.

[0032] Referring to FIG. **4**, an exploded view of the present invention is shown. The power distribution system **5** includes an outer case **10** with a display **102** housed within a display housing **100** that is hingedly connected to the outer case **10**. The power distribution system **5** has rotatable and exchangeable power distribution devices configurable with various power options that can be oriented so that power enters on the left side and exits on the right side or visa-versa, providing flexibility in the viewing direction of the display. The power distribution system **5** in this embodiment has two power input connectors which are, in this embodiment, a terminal block **23**. The input power wires are physically and electrically held by set screws **24**. The inputs are connected to a first terminal **42** of the fuses **40/44**. In this embodiment, two types of fuses are installed **40/44**, In some embodiments, only one type of fuse **40** or the other **44** is installed providing flexibility in protection for each output. The second terminal **42** of the fuses **40/44** is connected to a

second power output connector, in this embodiment, a terminal block **27** for connection to the output power wires (**30**/**32**/**34**/**36** in FIG. **1**), held electrically/physically with set screws **26**. The power distribution module **39** has a modular housing **76** that is symmetrical so that the power distribution module **39** is adaptable to be mounted within the outer case **10** in one orientation or in another opposite orientation, rotated 180 degrees horizontally. Wire guides **79** guide the two power input wires (**20**/**22**) into the terminal block **23** and wire guides **78** guide the power output wires (**30**/**32**/**34**/**36**) into the output terminal block **27**. A circuit board **70** provides power and video distribution to the display **102** and holds the video input connector **104**. In some embodiments, a graphics display controller (see FIG. **6**) is mounted on the circuit board **70**. A bottom cover **72** protects the circuit board and holds the power distribution module **39** within the outer case **10**.

[**0033**] Referring to FIG. **5**, a perspective view of the apparatus of the present invention configured for opposite connections to that of FIG. **1** is shown. The power distribution system **5** includes an outer case **10** with a display (not visible) housed within a display housing **100**. The power distribution system **5** has a rotatable and exchangeable power distribution device configurable with various power options that can be oriented so that power enters on the left side and exits on the right side or visa-versa, providing flexibility in the direction of the display. The power distribution system **5** in this embodiment has four power outputs **30**/**32**/**34**/**36** connected through a power output connector, in this embodiment a terminal block **27**. The power output wires **30**/**32**/**34**/**36** are physically and electrically held by set screws **26**. The outputs **30**/**32**/**34**/**36** are connected to a first terminal **42** of the fuses **40**/**44**. In this embodiment, two types of fuses are installed **40**/**44** but in some embodiments, only one type of fuse **40** or the other **44** is installed providing flexibility in protection for each output **30**/**32**/**34**/**36**. The second terminal **42** of the fuses **40**/**44** is connected to a power input connector, in this embodiment a terminal block **23** for connection to the input power wires **20**/**22**. The input power wires **20**/**22** are electrically and physically coupled with set screws **24**.

[**0034**] Referring to FIG. **6**, a schematic diagram of the common electronics of the present invention is shown. In this embodiment, two DC inputs **20**/**22** enter the power distribution device or modular power circuit **115**. In other embodiments, one, three, four or any number of DC inputs is present. The content and function of the power distribution device **115** will be described in the description of FIGS. **7**-**10**. Generally, the power distribution device **115** is a device that accepts power from a power source and distributes the power to one or more power outputs. In some embodiments, the power distribution device **115** provides protection by way of fuses or surge suppressors or provides power conditioning.

[**0035**] Also in this embodiment, four DC outputs **30**/**32**/**34**/**36** exit the power distribution device **115**. In other embodiments, one, two, three or any number of outputs exit the power distribution device **115**. A connection to one of the DC inputs **22** is made to derive power for the internal electronics, indicators and displays. In some embodiments, the power passes through a fuse **110** to protect from an overload in the internal electronics and display. In the present embodiment, the input video signal **105** from the video input connector **104** is routed to a graphics display controller **112** which accepts a video signal from the video connector **104** such as NTSC, RGB, S-video, composite video, SECAM, PAL and the like, decodes the signal and generated signals required by the video display **102**, for example, LVDS (Low Voltage Differential Signal) and parallel. The display is preferably a liquid crystal display (LCD), but can be any flat panel display including Plasma.

[**0036**] In some embodiments, the graphics display controller **112** generates colors and patterns on the video display **102** independently of the video input **105**. In these embodiments, there is a user interface (not shown) consisting of an input device such as a keyboard or keyboard and mouse (not shown), configured to accept commands from a user to set up the display colors, patterns and sequences.

[**0037**] Referring to FIG. **7**, a schematic diagram of a fused distribution option **120** of the present invention is shown. The circuit shown includes two DC inputs **20**/**22** connected to four DC outputs **30**/**32**/**34**/**36** by fuses **40**/**44**. Note that in some embodiments more than one type of fuse receptacle is deployed in parallel providing flexibility in fuse selection and current handling. By installing more than one type of fuse in parallel, the current handling capacity is increased.

[**0038**] Referring to FIG. **8**, a schematic diagram of a distribution block option **130** of the present invention is shown. The circuit includes two DC inputs **20**/**22** directly connected to four DC outputs **30**/**32**/**34**/**36** through wiring paths **132**.

[**0039**] Referring to FIG. **9**, a schematic diagram of a high capacity capacitor option **140** of the present invention is shown. The circuit includes a DC input **20** directly connected to two DC outputs **30**/**32** with a capacitor **142** between the DC input **20** and ground **146**. The capacitor **142** is, for example, a high-capacity electrolytic or super capacitor. The value of the capacitor is, for example, 10-30 farads at 15 volts.

[**0040**] Referring to FIG. **10** illustrates a schematic diagram of a power conditioning circuit option **150** of the present invention. The circuit includes a DC input **20** that is conditioned with a power conditioning circuit **152** before passing to two DC outputs **30**/**32**. The power conditioning circuit **152** is also connected to a ground **156**. In some embodiments, the power conditioning circuit **152** includes circuitry to regenerate the standard 12V output by switching the DC input voltage at a high frequency into a transformer (e.g., a torroid transformer), then regulating and filtering the output of the transformer to conform to the required 12V output, thereby eliminating any voltage fluctuations and noise created by the vehicle's engine or high current devices such as starter motors, lights, power seats and the like.

[**0041**] Referring to FIG. **11***a*, a wire or power cable and power distribution system of the prior art is shown. The power cable **112** is substantially round or tubular and has a central conductor **111** and an insulator **113**. The power distribution system **9** of the prior art has a round receptacle **109** for accepting the power cable **112**. The height, h, of the power distribution system **109** must be greater than the diameter, d, of the power cable **112**.

[**0042**] Referring to FIG. **11***b*, a wire or power cable and power distribution system of the present invention is shown. The power cable **120** is substantially oval or elliptical and

has a central conductor **121** that is also substantially oval or elliptical and an insulator **123** that is also substantially oval or elliptical. The power distribution system **10** of the present invention has an oval or elliptical receptacle **107** for accepting the power cable **120**. The height, h', of the power distribution system **10** is greater than the diameter, d', of the power cable **120**, but since the diameter d' of the elliptical cable **120** is smaller than the diameter d of the round cable **112**, it is possible for the height h' of the power distribution system of the present invention to be less than the height h of the power distribution system of the prior art, providing a much lower profile power distribution system that looks better and fits better in tight compartments.

[**0043**] Referring now to FIG. **12**, a cable size adapter of the present invention is shown. The power distribution system **10** has openings and terminal blocks **107** that are sized to accept one size of wire **120**. The insulation **123** of the wire **120** is stripped, exposing the oval conductor **121** which is then inserted into the power distribution terminal block **10** into the oval opening **107** where it is held in place by a set screw (shown in FIGS. **1**, **4** and **5**). The size of the opening **107** and terminal block are adapted to one specific size of wire. If a smaller wire **130** is used without an adapter **135**, the set screw would not properly hold the wire in place and proper conduction would not be achieved. Instead, the smaller wire **130** has its insulation **133** stripped exposing its smaller oval conductor **131** and the exposed oval conductor **131** is inserted into a cable size adapter **135** and the smaller wire **130** and cable size adapter **135** are then inserted into the opening **107** and fastened with a set screw. In some embodiments, the cable size adapter **135** has a hole **137** sized to allow the set screw to pass through the cable size adapter **135** and apply pressure directly to the conductor **131**. The adapter **135** is made from a conductive material, preferably copper or brass. In some embodiments, the adapter **135** is plated with another conductive metal such as nickel, brass, gold or silver.

[**0044**] Equivalent elements can be substituted for the ones set forth above such that they perform in substantially the same manner in substantially the same way for achieving substantially the same result.

[**0045**] It is believed that the system and method of the present invention and many of its attendant advantages will be understood by the foregoing description. It is also believed that it will be apparent that various changes may be made in the form, construction and arrangement of the components thereof without departing from the scope and spirit of the invention or without sacrificing all of its material advantages. The form herein before described being merely exemplary and explanatory embodiment thereof. It is the intention of the following claims to encompass and include such changes.

What is claimed is:

1. An power system with display comprising:

an enclosure;

a graphics display housed in a display housing, the display housing hingedly coupled to the enclosure;

at least one power input connector situated on the periphery of the enclosure;

at least one power output connector situated on the periphery of the enclosure; and

a power distribution device housed within the enclosure, the power distribution device adapted to accept power from the at least one power input connector and the power distribution device adapted to deliver power to the at least one power output connector.

2. The power system with display of claim 1, wherein the power distribution device passes power directly from the at least one power input connector through at least one fuse to the at least one power output connector.

3. The power system with display of claim 1, wherein the power distribution device passes power from the at least one power input connector to the at least one power output connector and at least one capacitor is coupled between the at least one power input connector and a ground potential.

4. The power system with display of claim 1, wherein the power distribution device passes power from the at least one power input connector through a power conditioning circuit to the at least one power output connector.

5. The power system with display of claim 1, wherein the graphics display is controlled by a graphics display controller and the graphics display controller is connected to a video input connector mounted on the periphery of the enclosure.

6. The power system with display of claim 1, wherein the graphics display is controlled by a graphics display controller and the graphics display controller generates colors and patterns for display on the graphics display.

7. The power system with display of claim 1, wherein the power distribution device is adapted to be installed in a first configuration and in a second configuration, in the first configuration the at least one power input connector appearing on a first side of the enclosure and in the second configuration the at least one power input connector appearing on an opposite side of the enclosure.

8. A method for distributing power and providing a display comprising:

providing a power system with display, the power system with display comprising:

an enclosure;

a graphics display housed in a display enclosure, the display enclosure hingedly coupled to the enclosure, the graphics display connected to a graphics display controller and the graphics display controller connected to a video input connector;

at least one power input connector situated on the periphery of the enclosure;

at least one power output connector situated on the periphery of the enclosure; and

a power distribution device housed within the enclosure, the power distribution device adapted to accept power from the at least one power input connector and the power distribution device adapted to deliver power to the at least one power output connector;

connecting the at least one power input connector to a power input wire;

connecting the at least one power output connector to a power output wire; and

connecting the video input connector to a source of video.

9. The method claim 8, wherein the power distribution device passes power from the at least one power input connector through at least one fuse to the at least one power output connector.

10. The method claim 8, wherein the power distribution device passes power from the at least one power input connector to the at least one power output connector and at least one capacitor is coupled between the at least one power input connector and a ground potential.

11. The method claim 8, wherein the power distribution device passes power from the at least one power input connector through a power conditioning circuit to the at least one power output connector.

12. The method claim 8, wherein the graphics display is controlled by a graphics display controller and the graphics display controller is connected to a video input connector mounted on the periphery of the enclosure.

13. The method claim 8, wherein the graphics display is controlled by a graphics display controller and the graphics display controller generates colors and patterns for display on the graphics display.

14. The method claim 8, wherein the power distribution device is adapted to be installed in a first configuration and in a second configuration, in the first configuration the at least one power input connector appearing on a first side of the enclosure and ir the second configuration the at least one power input connector appearing on an opposite side of the enclosure.

15. An power system with display comprising:

an enclosure means;

a means to display graphic images mounted within a display enclosure, the display enclosure hingedly coupled to the enclosure means;

a means to input power situated on the periphery of the enclosure means;

a means to output power situated on the periphery of the enclosure means; and

a means to distribute power housed within the enclosure means, the means to distribute power adapted to accept power from the means to input power and the means to distribute power adapted to deliver power to the means to output power.

16. The power system with display of claim 15, wherein the means to distribute power passes power from the means to input power through at least one fuse means to the means to output power.

17. The power system with display of claim 15, wherein the means to distribute power passes power from the means to input power to the means to output power and at least one capacitor is coupled between the means to input power and a ground potential.

18. The power system with display of claim 15, wherein the means to distribute power passes power from the means to input power through a power conditioning circuit to the means to output power.

19. The power system with display of claim 15, wherein the graphics display is controlled by a graphics display controller and the graphics display controller is connected to a video input connector mounted on the periphery of the enclosure.

20. The power system with display of claim 15, wherein the means to display graphic images is controlled by a graphics display controller and the graphics display controller generates colors and patterns for display on the means to display graphic images.

21. The power system with display of claim 15, wherein the means to distribute power is adapted to be installed in a first configuration and in a second configuration, in the first configuration means to input power on a first side of the enclosure and in the second configuration the at means to input power on an opposite side of the enclosure.

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